Revised Right Hand Grip Rule for an AC/DC Current

Mr. Darnesh

Teacher, Ahmedabad, Gujarat, India

ABSTRACT

Right hand grip rule is perfect for Direct current (DC) but what about alternative current (AC)? Alternating current (AC) is an electric current that periodically reverses its direction, so does magnetic field direction changes periodically, in contrast to direct current (DC) which only flows in a single direction which cannot change sporadically, so does magnetic field direction does not affect. So, rule need to be corrected and separated for both AC and DC current. What do you think?

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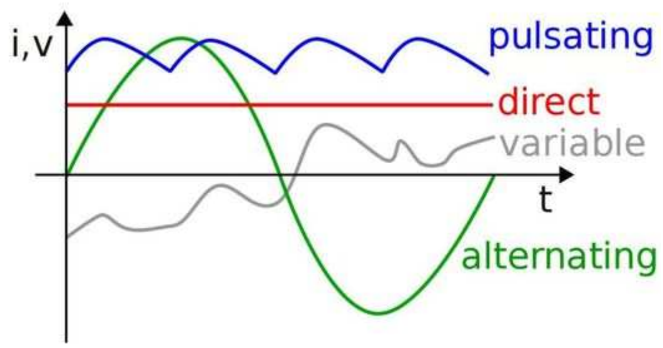
Let us understand by following examples and methods.

What is alternating current and direct current?

Alternating current (AC) is an electric current that periodically reverses its direction, in contrast to direct current (DC) which only flows in a single direction which cannot change sporadically.

How alternating currents is produced



Alternating current (green curve). The horizontal axis measures time; the vertical, current or voltage.

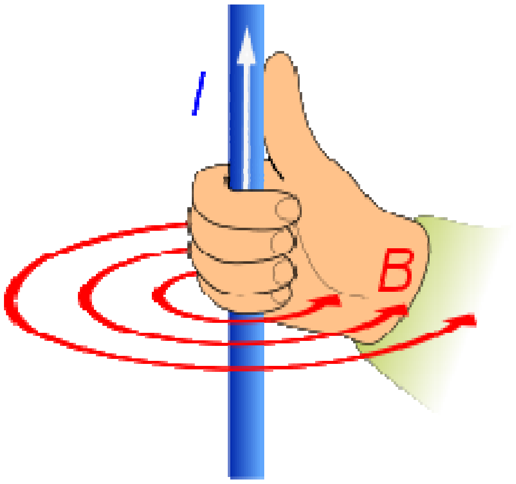
Although DC, the unidirectional flow of an electric charge, is perhaps one of the simplest of electrical engineering concepts, it is not the only “type” of electricity in use.

Both AC and DC describe types of current that flow in a circuit. Many sources of electricity, most notably electromechanical generators, produce AC current with voltages that alternate in polarity, reversing between positive and negative over time. An alternator can also be used to purposely generate AC current.

In an alternator, a loop of wire is spun rapidly inside of a magnetic field. This produces an electric current along the wire. As the wire spins and periodically enters a different magnetic polarity, the voltage and current alternate on the wire. This current can change direction periodically, and the voltage in an AC circuit also periodically reverses because the current changes direction.

AC comes in several forms, as long as the voltage and current are alternating. If an AC circuit is hooked up to an oscilloscope and its voltage is plotted over time, you are likely to see several different waveforms such as sine, square, and triangle – sine is the most common waveform and the AC in most mains-wired buildings have an oscillating voltage in the sine wave form.

Direction associated with a rotation :



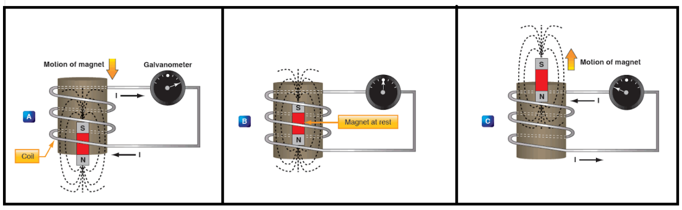
Prediction of direction of field (*B*), given that the current *I* flows in the direction of the thumb.

A different form of the right-hand rule, sometimes called the **right-hand grip rule**, is used in situations where a vector must be assigned to the *rotation* of a body, a magnetic field or a fluid. Alternatively, when a rotation is specified by a vector, and it is necessary to understand the way in which the rotation occurs, the right-hand grip rule is applicable.

This version of the rule is used in two complementary applications of Ampère's circuital law:

1. An electric current passes through a solenoid, resulting in a magnetic field. When you wrap your right hand around the solenoid with your fingers in the direction of the conventional current, your thumb points in the direction of the magnetic north pole.
2. An electric current passes through a straight wire. Here, the thumb points in the direction of the conventional current (from positive to negative), and the fingers point in the direction of the magnetic lines of flux.

Reason behind changed current direction :



As shown in diagram, galvanometer , magnet and conductor coil is placed in circuit.

When magnet south pole moves upward(figure A), magnetic field(B) direction changed so does current induced and direction of current detected in galvanometer.

When magnet covered by coil(figure B), current reduced to zero and rest direction of current shown in galvanometer.

Finally, north pole of magnet reached to the top of coil(figure C), current induced and direction is visible on galvanometer.

Below figure shows some examples of Direction while operating with AC/DC:

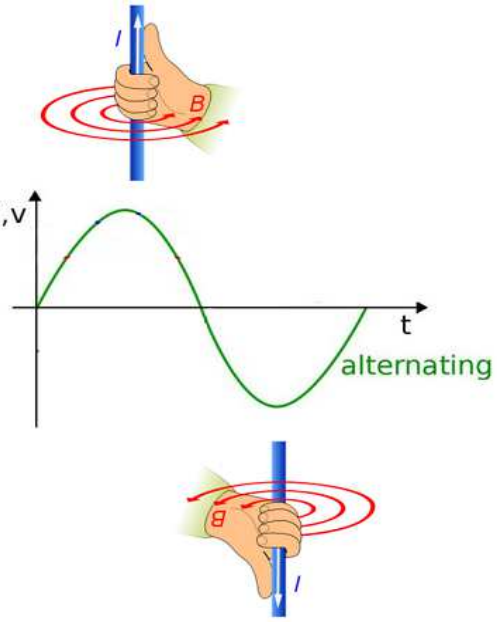
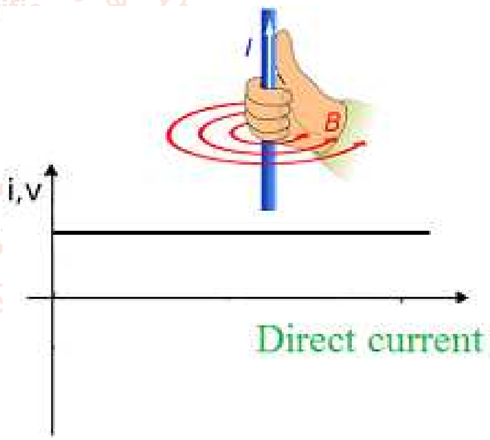


Figure: A Example of alternating direction while operating with AC waveform



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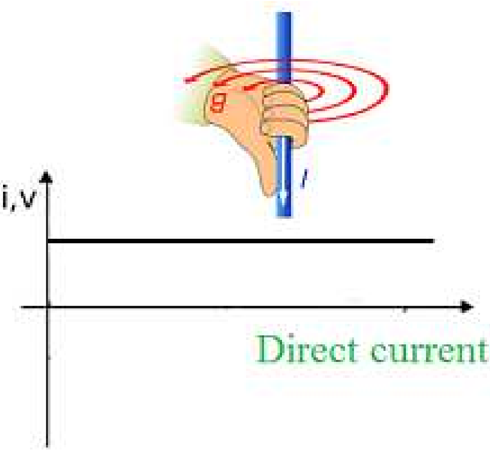

Figure: B
Example of steady direction while operating with DC waveform

Conclusion:

Diagrams and explanations indicate that the direction of magnetic field and current are following to each other. Direction of Magnetic field changes as polarity or direction of current changes.

So, in case of AC current polarity of current changed periodically. So the direction of magnetic field(B) changed clock wise and counter clock wise periodically.

While, in case of DC current direction of current remains in one region. So the direction of magnetic field(B) does not affect and remains in either clock wise or anti clock wise.

This is the one of the path to change and separate the **right hand grip law** for both AC current and DC current.

References:

[1] www.google.com

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